# Utilization of Digital Health Applications in Implementing the Dengue Vector Control Program

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***Abstract***

*One house one larva monitor movement is a dengue vector control program of the Ministry of Health which has been promoted since 2016. However, there are still several areas that have not been successful in implementing this movement, one of which includes the City of Padang. The purpose of this study was to examine the importance of using digital applications in implementing dengue vector control programs. This research is a research with qualitative methods using the case study genre through a constructivist approach. The location of the qualitative research was carried out at the Padang City Health Office, in the working areas of the Nanggalo Health Center, Pagambiran Health Center, and Rawang Health Center which were designated as research areas. This research was conducted in 2023 with informants including the person in charge of the dengue fever program at the Padang City Health Service, the person in charge of the dengue fever program at the Community Health Center, and the larva monitoring coordinator. The results of the study indicate that efforts to control dengue vectors through the One House One larva monitor Movement are still not running as they should. This movement can only run when larva monitor performs its main tasks and functions in accordance with the provisions. For this reason, it is necessary to carry out coaching and supervision efforts. However, there are several obstacles that require the design of a comprehensive and integrated digital health application to improve the health information system to improve the performance of larva monitors.*

***Keyword:* *Dengue Hemorrhagic Fever , Digital Health, Vector Dengue***

## INTRODUCTION

Dengue Hemorrhagic Fever (DHF) virus is generally spread by two main types of mosquitoes, namely Aedes aegypti and Ae. Albopictus (Hendri et al., 2015). These two types of mosquitoes have flourished in tropical climates, and because of that, Indonesia has been recognized as an endemic area for DHF (Harapan et al., 2019). In fact, the World Health Organization (WHO) has identified Indonesia as the country with the highest number of dengue cases in the Southeast Asia region (Kemenkes RI, 2010). In 2018, the number of DHF sufferers in Indonesia reached 65,602 people with 467 of them died from this disease. However, this number has drastically increased two-fold in 2019, reaching the status of an Extraordinary Event, with 138,127 DHF cases and 919 deaths, spread across 34 provinces including West

Sumatra Province. In West Sumatra Province, the incidence of DHF reaches 41.59% per 100,000 population (Kemenkes RI, 2020).

The Province of West Sumatra includes a number of districts and cities which are included in Dengue Hemorrhagic Fever (DHF) endemic areas. Among these areas are Padang City, Pariaman City, Bukittinggi City, Padang Panjang City, Pesisir Selatan Regency, Tanah Datar Regency, Solok Regency, Sawahlunto City, and Sijunjung Regency. Data from the West Sumatra Provincial Health Office indicates that Padang City has the highest DHF case rate in all areas of West Sumatra Province (Dinkes Sumbar, 2018). It is important to emphasize that there is not a single sub-district in Padang City that is free from the threat of DHF. In 2019, the number of cases recorded reached 430 infections which spread throughout the sub-districts within the scope of the public health center in Padang City (Dinkes Kota Padang, 2020).

The government has taken steps in an effort to deal with Extraordinary Dengue Hemorrhagic Fever (DHF), which involves a number of actions. These steps include treatment and care for DHF sufferers, epidemiological investigations that aim to understand aspects of the causes, sources, modes of transmission, and the factors that influence the emergence of outbreaks. In addition, outreach efforts to the community were also carried out as part of this strategy. Furthermore, to break the chain of disease transmission, vector control or mosquito-transmitting measures are carried out as an effort to combat dengue outbreaks (Sinaga, 2015).

The Mosquito Nest Eradication Program which is focused on controlling the development of Aedes aegypti mosquito larvae is still considered the main effort in breaking the chain of transmission of Dengue Hemorrhagic Fever. This program is given priority by the government and is expected to be implemented by the entire community (Lesmana et al., 2020). The Mosquito Nest Eradication Program has a very important role because it involves practical actions that are effective in eradicating mosquito vector transmission. Therefore, this program is a concrete step that has the potential to prevent dengue fever (Rahmania & Indriyani, 2018).

Efforts to control Dengue vectors through the Mosquito Nest Eradication Program depend heavily on the involvement of all levels of society in its implementation (Saragih et al., 2019). However, until now, the implementation of mosquito nest eradication activities has not reached an optimal level due to various obstacles encountered in the field. These obstacles include inequality in the implementation of policies related to prevention and control of Dengue disease, the absence of Regional Regulations that support policy implementation, lack of collaboration across sectors, and the low active role of the Dengue Operational Working Group. The impact of these conditions affects aspects of public health. This is reflected in the low number of families participating in eradication of mosquito nests activities related to Dengue.

As a result, many areas in Indonesia are still not free from cases of Dengue, which is caused by the low success rate of controlling mosquito larvae, which is less than 95%. In 2019, Dengue Extraordinary Events occurred in 22 provinces, and even up to 2021, reports show that there are still 387 regencies and cities in 32 provinces that have contracted Dengue disease (Hurint, 2021).

It is important to continue to increase the role of the family in monitoring, examining and controlling mosquito larvae as part of efforts to prevent Dengue. In order to achieve this goal, the government has implemented the "One Home One Larva Monitor Movement" policy (Kemenkes, 2016). The concept of this movement is based on a community empowerment approach, especially at the family level, with the aim that every house has a larva monitoring officer. The role of this larva monitor includes the task of inspecting, monitoring, and controlling mosquito-transmitting larvae around their home environment. This approach empowers the community to independently carry out these tasks. By involving every family member in this program, it is hoped that it can increase the effectiveness of efforts to control the Dengue vector (Selviana, 2019).

"One Home One Larva Monitor Movement" is an initiative that has been introduced by the Ministry of Health since 2016 (Yuningsih, 2018). Several areas in Central and East Java, such as Semarang City, Tegal Regency, and Surabaya City, have successfully reduced Dengue cases through the implementation of this program (Dinkes Jawa Tengah, 2021); (Hadi, 2020). Even so, there are still several regions that have not succeeded in implementing the "One House One larva monitor Movement," one of which is the City of Padang. As described in the book "National Strategy for Dengue Control 2021-2025," there are several challenges in implementing this program. Some of these include the absence of clear indicators for this program, the community is not yet fully independent in carrying out this program on an ongoing basis, limited budgets for implementation, an inadequate recording and reporting system, and monitoring and evaluation that are not optimal (Kemenkes RI, 2021).

The results of an initial survey conducted by researchers at the Padang City Health Office revealed the fact that the "One Home One Larva monitor Movement" policy was only implemented in Padang City in 2019. Since this policy was enacted, based on information from the Person in Charge of the Dengue Program at the Padang City Health Office , there are only three Community Health Centers that routinely and disciplinely carry out recording and reporting on the activities of the Mosquito Nest Eradication Program in the field. These health centers are the Nanggalo Health Center, Pagambiran Health Center, and the Rawang Health Center. Even though the three public health center have been active in carrying out activities

to eradicate mosquito nests, it turns out that the larva-free rate in these three public health center is still below the national target, which is less than 95%. Further investigations at the three Community Health Centers revealed the fact that they were still using the old method of carrying out activities to eradicate mosquito nests. This was due to the various obstacles they faced, which resulted in them having difficulty in implementing the "One Home One Larva Monitor Movement" in the working areas of each public health center.

This movement is still not running as it should, because the dengue vector control program can only run when larva monitor performs its main tasks and functions in accordance with the provisions. For this reason, it is necessary to carry out coaching and supervision efforts. However, there are still several obstacles such as the large number of coverage, the small number of active cadres, and the limited resources available, requiring the design of a comprehensive and integrated model to improve the health information system to improve larva monitor's performance. Based on the background above, researchers are interested in seeing the importance of using digital health applications in implementing Dengue vector control programs.

## METHODS

This study used qualitative research methods using the case study genre through a constructivist approach. By combining qualitative methods and a constructivist approach, this study seeks to provide an in-depth understanding of the weaknesses in the implementation of the dengue vector control program in the social context of Padang City (Suharmi, 2013). In this study, we explored indicators related to the factors that influence the Implementation of the Dengue Hemorrhagic Fever Vector Control Program which include communication factors, resources, dispositions, and bureaucratic structures. The research method at this stage uses a qualitative approach with in-depth interviews (Afrizal, 2014).

The location of the qualitative research was carried out at the Padang City Health Office (Inf-1), in the working area of the Nanggalo Health Center (Inf-2), Pagambiran Health Center (Inf-3), and Rawang Health Center (Inf-4) which were designated as research areas, were made as health centers that represented the criteria because based on the data obtained from the Padang City Health Office it was known that these Health Centers were good Health Centers and routine in terms of reporting compared to 23 other Health Center, but still have a fairly high Incident Rate, namely Nanggalo Health Center 39.68, Pagambiran Health Center 33.03 Rawang Health Center, and 22.53 for Rawang Health Center (this rate is certainly higher than the national Incidence Rate = 14). Determination of informants in this qualitative research uses

a purposive sampling technique, which means the selection of samples with a deliberate mechanism, namely a technique of determining and selecting informants based on characteristics (Susianti, 2019).

The in-depth interview informants in this study were the person in charge of the DHF program at the Padang City Health Office, the person in charge of the DHF program at the Nanggalo Health Center in Padang City, the person in charge of the DHF program at the Pagambiran Health Center. Padang City Hall, and Person in Charge of the DHF Program at the Rawang Health Center, Padang City. Data was collected through observation methods, in-depth interviews and focus group discussions. Qualitative data management is done by making data transcripts, data reduction, data presentation, conclusions and verification (Rijali, 2019). While data analysis was carried out by triangulation which included data triangulation, observer triangulation, theoretical triangulation, and method triangulation.

**RESULTS**

Based on the research results obtained at the Padang City Health Office, it shows the fact that the policy regarding the One House One larva monitor Movement was issued late in Padang City, namely in 2019. Dengue Hemorrhagic Fever Vector Control which includes communication, resource, disposition, and bureaucratic structure factors. Data collection qualitatively done by in-depth interviews with several informants.

Based on the results of interviews about communication factors, it was found that the information obtained by the public health center from the Padang City Health Office was not conveyed optimally and evenly to the public. So far, although human resources as executors already exist, there has been no regular training or guidance held by the health office for both coordinators and supervisors, so they are only guided by a decree in carrying out their duties and responsibilities. This can be seen from the following informants:

> *"The agency provides training to the larva monitor coordinator, and so on the public health center is responsible for providing guidance to larva monitor Rumah..."* (Inf-1)
> *"For bundo larva monitor, the training is from Padang City Health Department, but it has been held for a long time, there is currently no renewal..."* (Inf-2)
> *"The cadres must be trained individually, because until now there has been no training held by Padang City Health Department (there should be at least 1 time/year)..."* (Inf-4)

Based on interviews with persons in charge of the DHF Management Program at the Padang City Health Office, Nanggalo Health Center, Pagambiran Health Center, and Rawang Health Center, it was found that the obstacles in implementing the one house one larva monitor movement policy also included human resources, budget, facilities, information, and authority. The impact of the limited human resources willing to become larva monitor coordinators is that

larva monitor coordinators come from local posyandu cadres, so that it overlaps with their routine duties. This can be seen from the following informants:

> *"Posyandu cadres once in a while act as larva monitor cadres..."* (Inf-2)
> *"The cadres are taken from posyandu cadres who are willing…"* (Inf-4)

Another obstacle is the limited budget at the Padang City Health Office and the public health center. The consequence of this is that many activities do not go according to plan, the work motivation of field staff is due to the limited incentives received. Incentives are often non-standard and depend on the availability of the Health Operational Cost budget allocated for this activity by each public health center. This can be seen from the following informants:

> *"Provided by each health center through Health Operational Cost budget. Sometimes there are also active kelurahans, so they can also be allocated from kelurahan funds..."* (Inf-1)
> *"The source of funds for cadre incentives is taken from the health operational assistance fund..." (*Inf-2)
> "*Bundo larva monitor still wants to go to the field because there are incentives/transportation money from the BOK funds provided by the public health center, if this money is not issued then it is not certain that they are still willing..."* (Inf-3)

Minimal budget also affects minimally available facilities, such as operational tools for both internal and external activities.This can be seen from the following informants:

> *"The Padang City Health Office provides blank larva cards that must be attached to each house, but not enough for all residents' homes due to budget constraints..."* (Inf-1)
> *"The cadres were provided with larvae cards from DKK, but the number was insufficient because the working area of the public health center consisted of 6,300 houses, but only 200 were given. Coupled with the public health center funds, the addition was only around 1,000, because even if many were provided, it was not certain that the cadres would fill it…"* (Inf-2)

Based on the disposition aspect, the facts show that in the implementation of the larva monitor One House One Movement in Padang City there were also problems with information and authority, especially in recording and reporting activities. According to the explanation of the Program Manager at the Public health center, it was found that many reports from the larva monitor coordinator were still not in accordance with the reality on the ground. Apart from that, the facts also show that the intensity of the executors in communicating with the target group is still low, so that no solutions are found for the problems encountered in the field. This can be seen from the following informants:

> *"In the past, reporting was done every month, but due to funding constraints for cadre incentives, now reporting is not routine, only done once every 4 months..."* (Inf-2)

*"Out of 5 cadres in 1 kelurahan, on average there is only 1 cadre who actively collects reports every month, while the rest only want to collect reports when the transport money is out..."* (Inf-3)
*"There are monitoring reports for larvae every month. However, the performance of cadres still depends on the incentives given, on average they are only willing to report if incentives are issued…"* (Inf-4)

Based on the bureaucratic structure factor, it was found that the organizational structure of the larva monitor One House One Movement in Padang City was incomplete. Ideally, this organization would have a larva monitor, a larva monitor coordinator, a larva monitor supervisor, and a public health center Health Officer. Facts found in the city of Padang, namely that the Health Center Health Officer plays a direct role as a larva monitor supervisor. In addition, the public health center also does not yet have regulations and Standard Operating Procedures to guide the implementation of the movement. The unavailability of standard operating procedures resulted in the low control exercised in program implementation. Especially with the unavailability of a comprehensive and integrated system that can control program implementation (starting from the socialization stage to evaluation). This can be seen from the following informants:

*"There is no online reporting system implemented at the Padang City Health Office, so far it's still manual. At the Padang City Health Office for the new malaria control…"* (Inf-1)
*"Reporting is still hard copy submitted to the Padang City Health Office, there is no system or application for reporting the results of monitoring larvae..."* (Inf-3)

Here you can see a picture of the problem tree causes of weak implementation of dengue vector control:

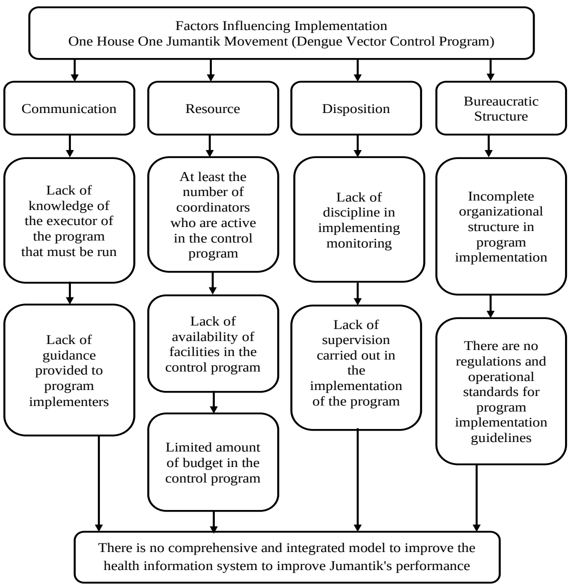



**Figure 1. Problem Tree Causes of Weak Implementation of Dengue Vector Control**

After collecting data through in-depth interviews and focus group discussions regarding the implementation of the dengue fever control program which includes four factors, namely communication, resources, disposition and bureaucratic structure, it can be seen that based on the problem tree above, the root problem of this research topic is the absence of a model which is comprehensive and integrated to improve the health information system to improve larva monitoring performance.

## DISCUSSION

The One House One Larva Monitor Movement is still not running as it should in Padang City. There are still obstacles in its implementation which include communication factors, resources, dispositions, and bureaucratic structures. From the research results, it is known that the communication factor has a significant impact on program implementation. The information received by the public health center from the Padang City Health Office has not been delivered optimally and evenly to the public. Even though there are human resources acting as program implementers, the lack of communication means that relevant information is not spread effectively throughout the community.

In addition, the research results also indicate that although there are human resources responsible for program implementation, they have not received routine training or guidance from the Health Office. As a result, they are only guided by the decree to carry out their duties and responsibilities. Lack of training or guidance can result in a lack of in-depth understanding of program implementation strategies and techniques.

Therefore it is necessary to create a system that can facilitate communication between the Health Office and the public health center and program implementers. This system needs to combine the roles of government and society and is designed in the form of a website-based digital health application in order to improve the health information system in order to improve larva monitor's future performance through increased coaching and supervision activities. Especially in the current situation, where people prefer to use the internet, smartphones, or social media in finding and receiving information, it is necessary to think about the right way to use this technology in an effort to find the best solution to overcome problems related to the low performance of larva monitor in the One House One Movement. larva monitor in Padang City. In addition, with the establishment of this system, it is hoped that coaching can be carried out evenly so that it is hoped that implementers will have a clear understanding of their duties and responsibilities and be able to carry out the program effectively.

Communication that is still not running effectively makes the purpose of policy outreach not achieved, many people don't know about the movements that must be carried out. In fact, in this movement it is known that it is the community that is expected to be the spearhead in determining the success of the program (Novriadi, 2017).

In addition to the communication factor, the resource factor also has several constraints. The limited number of human resources who are willing to become coordinators for larva monitoring officers has a certain impact on program implementation. As a result of these limitations, larva monitor coordinators are often found to be local posyandu cadres. However, this condition also causes overlap between the routine duties of posyandu cadres and their roles and responsibilities as larva monitor coordinator.

The main impact of this overlap is the potential for larva monitor coordinators, who are also posyandu cadres, to experience excessive workload. Posyandu cadres already have responsibilities and a schedule of tasks that must be carried out in posyandu activities, such as maternal and child health services, as well as health counseling. By adding a new role as larva monitor coordinator, their workload can increase and potentially reduce the efficiency and quality of the cadre's task implementation.

Budget constraints at the Padang City Health Office and Community Health Centers are also a significant obstacle to program implementation. The main impact is that many activities cannot be carried out according to a predetermined plan. Budgetary constraints hampered the ability to allocate the necessary funds for various aspects of program implementation. In addition, budget constraints also affect the work motivation of field officers. Lack of consistent incentives and standards can reduce their motivation and enthusiasm in carrying out the required tasks. This situation can also be detrimental to the quality of program implementation as a whole.

This condition indicates the need for more attention in adequate budget allocations to support the implementation of DHF control programs. Clear and consistent incentive standards need to be implemented to ensure that field staff feel valued and motivated in carrying out their duties. In the long term, this effort will help improve the quality of program implementation and achieve better results in the prevention and control of DHF. The lack of budget in program implementation has a wider impact, including on the availability of facilities and equipment. Budget limitations can result in minimal resources available to support internal and external activities of the dengue vector control program.

The system in the form of a health application that will be designed is expected to make the process of conveying information in the framework of community development easier and

faster, so that the distribution of information will be more even than before using the application. The application of this system is also expected to simplify the process of coaching the community without having to increase the frequency of larva monitor coordinators to go to the field, so that it will minimize the budget that should be provided.

Based on the disposition aspect, the facts found indicated that in the implementation of the larva monitor One House One Movement in Padang City there were several problems related to information and authority, especially in recording and reporting activities. According to the explanation from the Program Manager at the public health center, it was found that many of the reports submitted by the larva monitor coordinator were still inaccurate according to the situation in the field. This was disclosed because there were still many members of the community and cadres who were not really involved in the movement, but reports still had to be submitted every month.

In addition, the facts also reveal that the executor's intensity in communicating with the target group is still low. This results in a lack of understanding of the problems encountered in the field and the difficulty of finding the right solution. This indicates that there is a need to improve communication and engagement with the community and cadres in order to understand the actual situation and gain valuable input for program improvement.

From these findings, it is apparent the importance of improving recording and reporting mechanisms as well as accurate monitoring and ensuring that reporting reflects the reality on the ground. In addition, further efforts are needed to improve interaction and communication between program implementers and the target group, so that appropriate solutions can be identified and program implementation can be more effective. With the digital health application, it is hoped that the recording and reporting process will also be more systematic, so that monitoring activities that will be carried out directly to the field will be more targeted. Reporting will come directly from the community and the larva monitor coordinator just needs to follow up on larva monitor reports that have not yet been entered into the system.

Through this application a communication network system will also be built between health offices, public health center, supervisors, coordinators, and larva monitor cadres with the aim of increasing communication and coordination between parties involved in program implementation, so that it will facilitate equalization of perceptions because the source of information comes from one door. The existence of a good communication network system is also expected to increase the control carried out in program implementation so that in the future there will be an increase in larva monitor performance so that it is hoped that it will have an impact on reducing the incidence of dengue in the city of Padang.

Digital health or more commonly referred to as telehealth (telehealth) is the use of telecommunications to provide health information and services with a broad scope with the aim of improving public health efforts (WHO & ITE, 2012). The use of telehealth continues to increase from year to year, many health services in the world have now adopted it. The effectiveness of telehealth in bridging the delivery of promotive preventive health services has been proven by many studies (Gabarron & Wynn, 2016).

Generational change has caused Indonesia to be dominated by the technology literate generation. The speed of response from the younger generation in taking advantage of various advances and sophistication in this digital era, must be utilized in the health sector in responding to health challenges. The 2016 Indonesian Internet Service Providers Association survey reported that 132.7 million or 51.8% percent of Indonesia's population are connected to the internet. Currently, Indonesia is also the third largest smartphone user in Asia-Pacific. The same survey also reported that internet penetration of 100% was found in adolescents aged 10-14 years, especially students. 100% penetration was also found among employees in the private sector and the health sector (Sunjaya, 2019).

This technological advancement certainly brings opportunities and can be a force to support digital health programs as the spearhead of health programs. The open exchange of health information between individuals and health workers through the use of electronic technology will lead to an increase in health services and public health status, including in dengue vector control programs. Quick access to larva monitor by the coordinator will help to increase the coverage of dengue vector monitoring so that it can help increase the larva-free rate and reduce the incidence of DHF.

Better, efficient, quality and cost effective access to health is the main advantage of using telehealth. The difficulty of access to larva monitor by the coordinator due to the wide coverage of the work area can be overcome by using telehealth. The use of telehealth besides being able to bridge access, in the dengue vector control program can also improve the recording and reporting system so that it can be more integrated and integrated. Telehealth has no time and place restrictions between the community and health workers.

In addition to the socioeconomic benefits that communities, families, health workers and health systems can derive, the use of telehealth can also be used for education and two-way communication between the community and health workers. The use of digital health applications can reduce directly or indirectly the number of public complaints (Sunjaya, 2019). The implementation of telehealth using digital media is not limited by place, so currently health services, especially those that are promotive and preventive, do not have to be carried out in

health facilities. This will be able to help reduce the need to increase the quantity of health service facilities, so that existing funds can be better utilized to improve the quality, existing facilities and infrastructure.

In the electronic era, the use of paper began to be replaced in the form of electronic data. Technological developments make electronic systems integrated with web platforms (McKeering et al., 2017). The development of various applications is increasing along with the production of devices with operating systems that are closer to human life which are intended for the convenience and comfort of their users. From the facilities provided, it is expected to improve the quality of government health services to the community.

## CONCLUSIONS

The results of research on the implementation of the dengue vector control program show that there are still obstacles in terms of communication, resources, disposition, and bureaucratic structure. The use of technology, especially in the health sector in the form of digital health, needs to be developed so that it can be more useful for many people. Cross-sectoral collaboration and support is needed and will determine the success of the digital health application that will be designed. Therefore there is a need for research that digs deeper into the needs in designing digital health applications for dengue vector control programs.

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